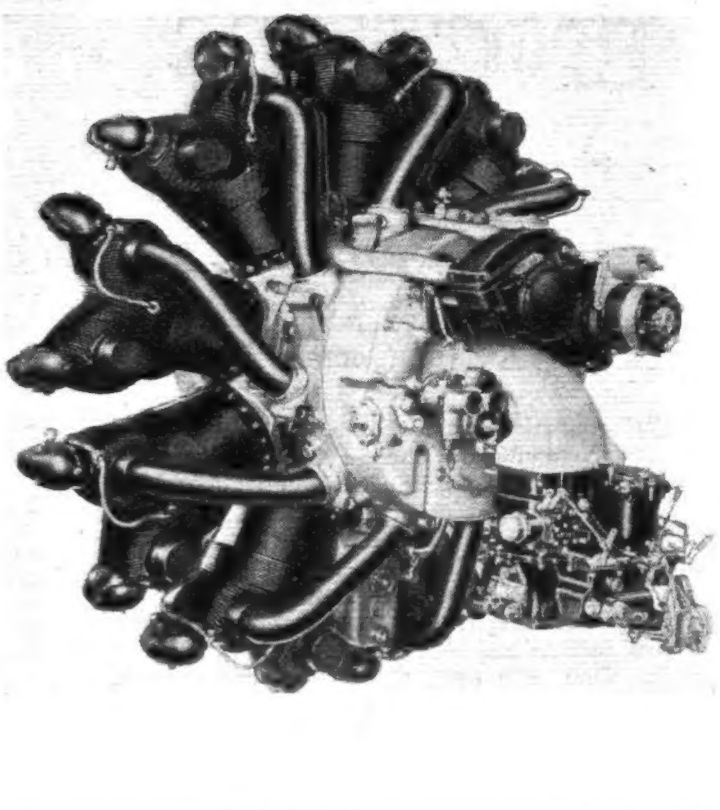

A new nine-cylinder radial, the Bramo 323 J Fafnir, powers the Dornier Do.19 experimental bomber. A Farman-B.M.W. reduction gear of 1.61 : 1 ratio is fitted and the engine is supercharged for operation at 13,780 feet.

has a Farman reduction gear and is rated at 5,250 ft., while the Sagitta II has an upturned spur-type reduction gear for cannon mounting and is fully supercharged with a normal rating of 500 h.p. at 12,150 ft.

At a time when the two-row radial is in the ascendancy it seems strange that a new design of large nine-cylinder, single-row engines should appear, particularly as Germany holds the licence to build Pratt and Whitney engines. The Bramo Fafnir's 850 h.p. should, however, have useful commercial applications.

A design not developed in this country is the inverted vee-eight air-cooled layout. Hirth and Argus models have been in wide use in Germany for some time in what might be called the higher-powered private owner and lower-powered commercial category, and examples of these appear at Milan.

The Czech name of Walter creeps into almost every category of aero engine, and there are very few firms which produce such a varied range in size and power rating. The tiny two-cylinder Atom is of only 1,100 c.c. capacity and gives a maximum of 28 h.p. at 3,000 r.p.m. The smallest inverted four in line is the Mikron, which is now in Mark II form, giving 62 h.p. for take-off. Another ultra-light unit is produced by C.N.A. at Rome.

Maker, Type, and Nationality	No. and Arrangement of Cyls.	Cooling.	Capacity (litres).	Normal Power (h.p.).	Dry Weight (lb.).
ALFA ROMEO (Italy):					
110 I.	4 I.L.	A.	6.124	120	288
115 I.	6 I.L.	A.	9.186	190	463
D.2 C.30	9 R.	A.	13.741	250	617
126 R.C.34	9 R.	A.	28.63	750	1,069
126 R.C.10	9 R.	A.	28.63	800	1,058
135 R.C.33	18 2R.	A.	—	—	—
ARGUS (Germany):					
As. 10C. III	8 I.V.	A.	12.7	200	465
BRANDENBURG (Germany):					
Bramo SH. 14 A.4	9 R.	A.	7.7	128	297
Bramo Fafnir 323J.	9 R.	A.	26.82	830	1,201
C.N.A. (Italy):					
C. II (bis)	2 H.O.	A.	1.4	38	20.6
C. VI I.R.C.43	6 I.L.	A	4.2	150	407
FIAT (Italy):					
A.70	7 R.	A.	8.361	205	368
A.30 R.A.	12 V.	Lq.	24.48	550	1,058
A.74 R.C.38	14 2R.	A.	31.250	840	1,256
A.80 R.C.41	18 2R.	A.	45.720	1,000	1,598
A.80 R.C.20	18 2R.	A.	45.720	1,100	1,598
A.S.6 (Racing)	24 V.	Lq.	51.100	3,100	2,050
HIRTH (Germany):					
HM. 60R.	4 I.L.	A.	3.6	66	203
KM. 504A.	4 I.L.	A.	3.98	75	308.6
HM. 506A.	6 I.L.	A.	5.97	135	327
HM. 508H.	8 I.L.	A.	7.96	200	441
HISPANO-SUIZA (France):					
14 AA.	14 2R.	A.	45	980	1,311
14 AB.	14 2R.	A.	32	670	1,014
12 Ycrs.	12 V.	Lq.	36	880	1,036
ISOTTA FRASCHINI (Italy):					
Asso Caccia	12 V.	A.	20.61	440	840
Asso 120 I.R.C.C.40	—	—	26.685	665	1,146
Asso XI R.2.40	12 V.	Lq.	32.646	836	1,356
Asso XI R.2.C.15	12 V.	Lq.	32.646	880	1,356
Asso L.121 R.C.40	12 V.	Lq.	32.646	900	1,356
Asso XI R.	12 V.	Lq.	32.646	670	1,330
Asso 750 R.C.35	12 V.	Lq.	47.10	870	1,724
Astro 7 C.40	7 R.	A.	20.8	400	723
Astro 7 C.21	7 R.	A.	20.8	460	723
Astro 140 R.C.35	14 2R.	A.	34.688	820	1,290
JUNKERS (Germany):					
Jumo 210	12 I.V.	Lq.	19.7	550	974
Jumo 211	12 I.V.	Lq.	35.0	700	1,278
PIAGGIO (Italy):					
P. VII C.16	7 R.	A.	19.334	460	716
P. VII C.45	7 R.	A.	19.334	450	750
P. X R.	9 R.	A.	24.858	700	948
P. IX R.C.40	9 R.	A.	24.858	600	981
P. XI R.C.40	14 2R.	A.	38.6	1,000	1,444
P. XII R.C.40	18 2R.	A.	56.904	1,600	1,764
GNOME-RHONE (France):					
M.14	14 2R.	A.	18.98	680	923
P.18	18 2R.	A.	54.24	1,500	1,874
WALTER (Czechoslovakia):					
Atom	2 H.O.	A.	1.1	25	88
Mikron II	4 I.L.	A.	2.33	60	134
Minor 4	4 I.L.	A.	4.0	85	205
Major 4	4 I.L.	A.	6.124	120	308
Major 6	6 I.L.	A.	9.2	190	386
Sagitta I.R.C.	12 I.V.	A.	18.37	470	794
Sagitta II R.C.	12 I.V.	A.	18.37	435	860
Bora II	9 R.	A.	9.35	210	364
Bora II R.	9 R.	A.	9.35	230	379
Super Castor I R.C.	9 R.	A.	18.8	400	782

R. = Radial. 2R. = 2 Row R. I. = Inverted. H.O. = Horizontally opposed. V. = "V" Formation. L. = In Line. Lq. = Liquid. A. = Air.

The Hafner's Tie-rods

"WE can see the limitations of fixed wings—we must beware of the limitations of fixed ideas; and if we are to avoid flying and thinking in circles we must make the wing rotate." This rather neat epigram concludes the lecture which Mr. R. Hafner is giving to the R.Ae.S. to-night. His subject is the Hafner Gyroplane, and he deals with it both historically and mathematically.

The Hafner A.R.III has already been described in *Flight*. The outstanding feature of the Hafner rotor head is the tie-rod which supports each rotor blade, affording it freedom to change its angle of incidence. This tie-rod also carries the centrifugal load of the blade, and it is no exaggeration to say that on the way in which the rod stands up to the loads imposed upon it depends the success of Mr. Hafner's scheme of incidence change. Fortunately, he is able to reassure his audience on this score. A tie-rod was given a very thorough test for possible fatigue effects, due to the torsional oscillation. A tensile load of 7.5 times the normal was applied, and a torsional oscillation with an amplitude of more than three times the maximum possible in the aircraft. The frequency was about four times that which occurs in flight. The tie-rod underwent three million reversals (more than 60 hours) without showing signs of fatigue or strain. Thus it seems that one need have no fear on that score.

Reduced Profits

PRESUMABLY arising out of the Air Ministry's statement, at the inception of the present expansion scheme, that aircraft constructors' profits would be limited, reductions have been made in Hawker dividends. The Ordinary and "A" Ordinary dividends are reduced from 20 to 17½ per cent., apparently as a result of a drop in earnings disclosed by the accounts for the year ended March 31, trading profits being £140,494, against £196,101. After allowing for income-tax, appropriation to capital redemption reserve fund, and Preference dividend, practically the whole of the available profit remaining is absorbed by the dividend.